VOL. XV. NO. 5.—BOTANICAL GAZETTE.—MAY, 1890.

Notes upon stamens of Solanaceæ.[1]

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(WITH PLATE XI.)

The stamens of the order Solanaceæ, so far as they have been examined by the writer, may be divided into those that dehisce by a pore at the top, those with a valvular dehiscence, and a modification of the latter where the wall of the anther breaks away irregularly, that is, peels off gradually midway between the dorsal and ventral sutures of the staminal leaf. Some of the Solanums, as S. tuberosum, S. rostratum, S. Carolinense and S. Dulcamara are examples of the first or terminal pore type; Lycium vulgare, garden Petunias and Daturas represent extreme forms of valvular dehiscence; while the tomato has a dehiscence midway between the two types; and the genus Physalis illustrates the form in which the wall of the anther-cavities peels off.

The stamens that open by pores have short filaments and long lance-shaped and very plump anthers, which fit closely around the style. The flowers are either pendent or hang laterally, so that it is not difficult for the pollen to make its escape through the hole at the top.

In Physalis they are of the same type. The Daturas have stamens with very long filaments, and the anthers are innate, plump, and when dehisced assume the shape of a spatula; while in Petunias it becomes apparently versatile and resembles a saddle when placed upright upon the rounded top of a hitching post. In color some are yellow, others white, and a few are purple, either in filament or anther, or both; sometimes striped. In short, there is a great variability, and at first there seems to be no constant structural feature. After a little work, however, has been done upon Solanaceous anthers, it will gradually appear that there is something distinguishing them from all others, and therefore characteristic. This resides in the peculiar fleshy central portion of the anther that may be called the "columella."

In the long upright anthers with pores, for example, the shape in cross section is like a butterfly with spread wings.

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[1]Read before the Biological Section of American Association for the Advancement of Science, at Toronto, 1889.

In other words, the anther is divided into two prominent halves corresponding to the wings of the butterfly. The pollen bearing portion is in the form of a very broad horseshoe, while all between is cellular tissue. The wall enclosing this pollen layer often separates early from the columella, thus throwing the two cavities into one, while the valves themselves do not separate from each other as is the case with those which dehisce longitudinally.

This type is adhered to so closely that if we select the two most widely different stamens in size, length of parts, cohesion, dehiscence, etc., as Solanum Dulcamara and Lycium vulgare, it will be found that a sketch of the cross section of one, as shown in fig. 1, will answer almost perfectly for the other.

In some cases, however, there are apparent exceptions that are somewhat puzzling. In the Daturas, for example, if one studies the mature stamen he is surprised to find that the dehisced anther is quite flat and spatula-shaped, with very little to suggest a fleshy central core. The valves in opening have turned outward and backward until they meet their neighbor's valves back to back. In D. Tatula this is most evident, for in this species the valves are purplish blue and the central portion of the anther is without color, thus leaving a white strip in the center. However, by making sections of the young plump anthers before dehiscence the large columella is found present but composed of cells with thin walls which, when exposed to the atmosphere, quickly dry up to so small a space as to seem almost entirely absent in the dehisced anther. In fig. 2 at *a* is shown a transverse section through a young anther of a Datura flower with the narrow horseshoe of pollen-bearing tissue and inside of that the thin-walled parenchyma of the "columella." At *b* is seen a view of a similar section of a dehisced anther with the valves shrunken and turned back so as to present the spatula appearance of the anther when looked at sidewise.

The single large stamen of Solanum rostratum, with its beak-like appearance, is a giant among its fellows, but does not exceed them in the production of pollen, for while three or four times larger than the others, its thecæ are reduced to narrow curved lines of mother cells. The ordinary stamens, upon the other hand, possess unusually large cavities in which the pollen is borne. The giant stamen in cross-section is shown at *a* in fig. 3, while a similar section of an ordinary stamen is seen at *b*.

The almost infertile condition of the large stamen reminds one of the structure of the stamens of the cultured potatoes. In these, while large and plump, there is almost no pollen-bearing layer, and usually no apical pore opens for the discharge of pollen. In an article presented by the writer last year upon the low seed-producing capacity of potatoes, these plump but sterile stamens were looked upon as a sort of fatty degeneracy, brought about by high culture and the lack of any demand for seed production for the preservation of the plant under the conditions which obtain with potato growers.

The horse nettle (Solanum Carolinense) has a form of mature anther that was at first sight a marked variation from the type. It dehisces by a pore, and we should expect that there would be but a single pollen cavity for each half of the anther. Instead of this there are two, and a seeming tendency to produce four. The explanation is again found in the shrinking of tissue by drying, as may be quickly seen by comparing the old with young anthers. A section of a young anther is shown at *a* in fig. 4, and the position of the dried parts in a mature stamen is seen at *b*. The two thecæ do not become joined by the obliteration of the wall between them. But this septum is reduced by drying to a tough membrane, and the columella—not large in this species—is reduced in the same way to a slender projection, one upon each side, and into their respective thecæ.

In the species of Physalis the anthers open near the point of union of the valves, and the thin tissue coils upon itself and drops away not unlike the epidermis from a healing blister, exposing the pollen as a thin layer upon the thick and rather firm columella. This takes place in anthers that in form and position correspond to those with pores, but both the pores and the valvular dehiscence fail and this peculiar modification exists instead.

When we come to consider the contents of the theca, the uniformity is peculiarly constant in the order. There are some differences in color of the pollen, that is, while some grains are colorless others are tinged slightly with brown, and the markings upon some species are more prominent than others, but obscure at the best.

When dry (figure 5, *a*) the pollen is long egg-shaped, with three sutures. By the addition of water an almost spherical shape is assumed, and the outer coat, bearing whatever there may be of color and fine markings, becomes sep-

arated at those places corresponding to the infoldings when dry, as shown at *b*, fig. 5. In other words, the imbibition of water causes the contents to increase, and the somewhat collapsed outer wall is distended by the thin hyaline inner and continuous coat. This causes the separation of the three portions of the denser outer coat and brings into prominence the belts of the exposed inner walls. These belts are like broad meridians upon the sphere that reach from near one so-called pole to the other. Midway, or at what may be termed the equator, there is an evident circular spot called the pore, and from one of the three the pollen tube protrudes in germination. At this equator there are also two evident radiating belts for each pore, one on each side, and in the equatorial line, so that a direct view upon a pore often gives the appearance of a cross.

As the size varies in the order, and is quite constant for the species, the micrometer may become a material aid in classification.

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A new grass.

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(WITH PLATE XII.)

Among the plants recently collected by Dr. Ed. Palmer, at La Paz, in Lower California, is a grass which presents many peculiar and interesting points, and whose relationship is very obscure.

It is a diœcious grass, 8 to 12 inches high, of a rigid habit, with erect culms from a creeping rhizome; the rigid, pungently-pointed, conduplicate leaves crowded toward the base, with loose overlapping sheaths. The culms are branching below, and sometimes continue to emit short fascicled branches nearly to the panicle; indeed, the panicle itself, in the female plant, seems to be a succession of similar branches reduced and modified.

The male plants have a racemose-spicate inflorescence, consisting of a single terminal sessile panicle of 3 to 5 alternate approximate spikelets, which are $\frac{3}{4}$ of an inch long, or there may be an umbellate cluster of 2 or 3 such racemes, or several single lateral branches of the same, on pedicels an